Natural Resources Pre-Incident Survey for Commander Naval Forces Japan

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Abstract

The Japanese Environmental Guidelines (JEGS) states in Chapter 18-3.1.b. (7) that Commander Naval Forces Japan (CNFJ) will prioritize a list of various resources that will be protected in the event of an oil spill. In addition, "the IOSC will have the authority to commit the resources needed to carry out the OHS Pollution Contingency Plan." In order to accomplish the above a Natural Resources Pre-Incident Survey has to be completed in order to track the resources that could be damaged or destroyed during an actual oil spill or that need to be tracked during a training exercise. In addition, the Japanese Marine Law Article 39, Marine Regulation Article 31 state that when specified oil is released in large quantities, necessary measures must be taken immediately (JELR Ch. 18.1.3.3). In these cases adequate response can not be accomplished without a Management Information System, an oil spill trajectory system, and a comprehensive Natural Resources Pre-Incident Survey.

Reviews of natural resource baselines are being conducted by the U.S. Navy in and around the naval areas of Yokosuka, Sasebo, Misawa and White Beach (Okinawa). The final Natural Resources Pre-Incident Survey will identify where resources are at risk and in what quantities. The Natural Resources Pre-Incident Survey will provide an assessment of marine resources and environmental sensitive areas that will require protection from open water spill incidents. This work requires corroboration between the U.S. Navy, the Japanese National and Prefectural governments, GIS experts and local interest groups. Communication skills, computer knowledge, natural resource training and familiarity with national and international laws will be relied on for the completion of this project.

The paper will examine the Natural Resources Pre-Incident Survey portion of an OHS Pollution Contingency Plan. The actual survey process, the unique natural

resources in Japan, the GIS compilation of data, and the contributions and collaborations among various government agencies will be presented.

Purpose and Need

The Department of Defense Japan Environmental Governing Standards (JEGS) states in Chapter 18-3.1.b.(7) that CNFJ will prioritize a list of various resources that will be protected in the event of an oil spill. In addition, "the Installation On-Scene Commander (IOSC) will have the authority to commit the resources needed to carry out the Oil and Hazardous Substances (OHS) Pollution Contingency Plan." In order to accomplish this, a Natural Resources Pre-Incident Survey needs to be in place to identify the resources that could be damaged or destroyed during an actual oil spill or must be identified during a training exercise. A Natural Resources Pre-Incident Survey is a useful tool to adequately commit the correct resources, at the right time and at the right location.

In addition, the Japanese Marine Law Article 39, Marine Regulation Article 31 states that when specified oil is released in large quantities, necessary measures must be taken immediately (Japan Environmental Law Report Ch. 18.1.3.3). In these cases adequate response cannot be accomplished without a Management Information System, an oil spill trajectory system, a comprehensive Natural Resources Pre-Incident Survey, and an up-to-date Navy On-Scene Commander (NOSC) plan.

Pre-Survey

In order to properly prepare a Natural Resources Pre-Incident Survey, reviews of resource baselines in and around Tokyo Bay (Navy areas of use), Misawa, Sasebo, and White Beach (Okinawa) were conducted. The Natural Resources Pre-Incident Survey identifies where resources are at risk and in what quantities. The Natural Resources Pre-Incident Survey provides an assessment of marine resources and environmental sensitive areas that will require protection from open water spill incidents.

Numerous Japanese agencies were contacted to collect existing baseline data. Primary agencies were the Environment Agency, the Japan Coast Guard, and prefectural governments. Collected data varied in completeness but adequately reflected a unique and complex coastal environment for Japan. Since fishing rights have been established along the entire Japanese coastline, fishing rights information, such as aquaculture, common fishing area, stationary net areas, were obtained. Marine biota environmental surveys, including algae, coral, and wetlands were collected from the Environment Agency. Also, natural resources information, such as birds and plants were obtained from local governments. Some natural resources have been designated as cultural resources in Japan, and this information was collected from the prefectural Board of Education.

Maps were also obtained from the Japan Coast Guard and Geographical Survey Institute. All collected data was organized in accordance with National Oceanic and Atmospheric Administration (NOAA's) Environmental Sensitivity Index (ESI) Guidelines.

NOAA's guidelines have been prepared for ESI surveys and maps to ensure the quality and congruency of efforts. The guidelines discuss the basic elements of a sensitivity mapping system, the collection and synthesis of data, and define the data structure for developing a digital ESI application using Geographic Information System (GIS). Standard guidelines unique to Japan have yet to be developed, therefore U.S. guidelines were followed.

Site Visit

The site visit to verify data collected through literature searches and requests from various Japanese agencies took place November 28 through December 18, 1999. Professor Nobuhiro Sawano, Japanese oil spill expert, accompanied Dawn Gell, Designers & Planners, Inc., biologist, at the four site locations.

Misawa, located in the northeastern portion of the main island of Honshu, was the first to be surveyed. The survey team was comprised of Professor Sawano, Dawn Gell, and a staff member from Naval Air Facility (NAF), Misawa who was familiar with the roads and habitat of the surrounding area. The study area was surveyed by foot and car over a 3 day period. Snow and bitter temperatures were obstacles for the team, making substrate samples difficult to collect and identify. Primarily, the substrate was sandy beach to the north, giving way to a rocky, gravel beach to the south. Hand-held Differential–Global Positioning System (D-GPS) was used to verify survey sites and data accuracy.

Sasebo, located on the southwestern portion of the island of Kyushu, was the second site to be surveyed. Here, the team was met by warmer temperatures and a complex, rocky shoreline. Commander Fleet Activities (CFA), Sasebo provided various ships for surveying purposes. The winding shoreline and steep cliffs made much of the area unapproachable by road. Ships allowed for direct access to the coastline and saved valuable time. The study area of Sasebo also encompassed the northern reaches of Kyushu. Here, the shoreline was primarily industrial with direct access to the Sea of Japan, making for high-energy wave surges against man-made structures and rocky cliffs. The exception to this area was a sensitive mud flat habitat used by horseshoe crabs as a nursery. The main portion of the survey encompassed many rocky shores, cobble and sandy beaches, low energy waves closer to the epicenter, man-made stone retaining walls and tidal areas.

White Beach (Okinawa), the third site visited, is located south of the main islands of Japan and experiences a tropical climate throughout the year. Here, Commander Fleet

Activities (CFA), Okinawa staff provided a small boat to access numerous islands within the study area. A car was also used for easily approachable sites. Much of the survey area covered a combination of shallow coral reefs, sandy beaches, and a few mangroves. These natural areas were in direct competition with various commercial and government expansion projects, landfilling practices, and industry to support the local economy found on the main island of Okinawa. The smaller, surrounding islands were primarily left in their natural state and comprised of rocky shorelines and sand beaches.

Commander Fleet Activities (CFA),Yokosuka, the final site visited, is located south of Tokyo on the western shore of Tokyo Bay. The study area covered both east and west sides of Tokyo Bay. The northern portion of the Bay was found to be primarily industrial, consisting of both Yokohama and Tokyo commercial ports. The Chiba district, located in the northeastern portion of the Bay, was also comprised of industrial sites. The majority of undisturbed natural resources were found in the southern and eastern portion of the Bay. Here, prime examples of beach vegetation projects and rare plant awareness/protection activities were visible. Man-made, rocky shorelines and a mixture of sandy beaches were found throughout the area. Support staff from CFA Yokosuka provided a boat to follow the perimeter of local islands, knowledge of the surrounding roads and habitats, and access to a ferry to survey the eastern portion of the Bay.

Throughout the site visits, digital and 35 mm photographs were taken, detailed notes were made, and D-GPS sites were recorded. GIS natural resource maps prepared prior to the survey were used as an aid for navigation and data input. Changes in information from the literature search were used to update the maps and new information was recorded. These maps were then brought back for final digitization.

Finding sheets were prepared for each site visited. On average, over 30 sites were visited at each location. Data recorded on the finding sheets include the following:

Name of Shoreline
Date
Time
Number
List of Photos taken at the site
Weather Observations
Tidal Level
D-GPS
Surveyed from (foot, car, boat)
Access Restrictions
Survey Crew
Sediment Type (as defined by NOAA guidelines)
Shoreline Type (as defined by NOAA guidelines)
Shoreline Scale
Sheltered Rock
Manmade Structures
Shoreline Vegetation
Aquatic Vegetation
Food Production
Human Use Facility
Slope (degrees)
Sketch of location

In order to properly record the above listed information, various types of equipment were used. Binoculars, range finders, survey post and measuring tape were

used to measure distance. Substrate samples were taken to be measured at a later time to determine grain and pebble size. D-GPS equipment was used to track site location.

An average sample site required two team members to gather data. First, a site location was determined by a change in the coastline. Once a change in the coastline was noted, the survey team would approach the shoreline by either foot, car, or boat. Pictures were then taken of the site. Pictures were taken to capture the entire coastline. Notes were used to record unique features of the site. Such features include vegetation, fishing nets, cultural resources, human use or industrial facilities.

The substrate of the site was also determined. Substrate samples were taken if the soil size could not be readily identified on site. These samples included sand grain and/or pebble of questionable size. Photographs of the soil were also taken to further substantiate findings and to measure size. [NOTE: Small, densely compact sand is less sensitive to oil than larger pebbles or mixed sized particles, due to the fact that larger pebbles allow oil to sink in and become trapped.]

Wave energy, recorded as a combination of the above listed factors, was noted at each location. There was a great difference in sensitivity directly linked to the shoreline's energy. It was important to note daily and seasonal fluctuations in wave energy as it influences the overall sensitivity of a site. Each of the four locations had areas that were strongly affected by seasonal changes and those that were not. For example, in Sasebo, sheltered coves that were not strongly affected by seasonal wave energy fluctuations were located close to areas exposed to the open ocean and underwent strong seasonal changes. [NOTE: If the area is sheltered, oil is more likely to remain for long periods of time before it is cycled out of the substrate. If the area is exposed to high energy waves, oil is more likely to be cycled out of the substrate quickly as it is pounded by waves and dispersed.]

Slope of the shoreline was measured. One member of the survey team stood at the edge of the water line holding a survey post vertically (tide measurements must also be recorded to note if survey occurred during high or low tide). The second survey member stood at the upper edge of the beach or survey site. Using a range finder, the distance between team members was measured, the height of the horizon line on the survey post was recorded, and the height of the range finder user was also noted to accurately determine the slope of the shore. If the area was quite small, a measuring tape was used in lieu of the range finder to determine distance. [NOTE: Slope is another very important factor in determining sensitivity. Steep areas are subject to higher wave energy of the waves breaking against the shoreline, and thus the oil disperses more easily. A flat area does not have this abrupt change in shoreline, thereby allowing the oil to remain for longer periods of time unaffected by constant wave energy.]

If the site could not be precisely located on a map, D-GPS information was recorded to accurately identify the site location. D-GPS technology has been used in Japan by the Coast Guard since April 1999. D-GPS in Japan uses approximately 25 mid-wave stations covering a 200 km radius at each location. The format of the D-GPS signal

has been internationally standardized and is being used around the world. The equipment used during this survey comprised of a hand held mid-wave receiver, a computer, and a portable satellite receiver. The accuracy of the data is within 10 meters, and depending on the proximity of the nearest mid-wave station, accuracy could be reached within 3 meters.

Post-Survey

Once the site visits were complete, finalization of the maps and species tables could begin. Remaining questions regarding various water in-take facilities and locations were answered through contacting appropriate officials. Other questions regarding the use of ports and fishing collectives were answered through the translation of Japanese documents. This additional information was transferred onto the maps and tables, including human use facilities obtained during the site visit to White Beach (Okinawa).

Coordination with developers and end users of COMNAVFORJAPAN oil spill trajectory software continued throughout the process. Seamless interface of data transfer was paramount for the success of any project. While developing GIS files, links between data tables and geo-referenced maps were established for ease of data viewing and consolidation of sources.

ArcView 3.2 is a GIS software which offers an innovative solution that allows one to create, visualize, analyze, and present information clearly. It was used for this project to accurately classify and digitize shorelines, biological data, and human-use resource information. NOAA's ESI Guidelines were followed while creating the GIS maps using ArcView 3.2.

Overall, the data was collected from documents, charts, site visits, and maps, then compiled into site-specific databases, as well as plotted onto hard copy master maps. These maps were then used by the GIS analyst, who digitized the information into the computer using ArcView 3.2. Once digitized, the analyst joined the databases to the maps. This procedure permits a user to click on a specific biological or human-use polygon, and view the information, which has been entered into the database, concerning the object.

Summary

CNFJ, in accordance with numerous regulations and policies, undertook the preparation of a Natural Resources Pre-Incident Survey in order to properly plan for possible oil spill occurrences. This effort has resulted in a unique gathering of data that has not been documented before in Japan. Also, although there has been a recent effort to develop specific ESI maps in Japan after a Russian tanker was grounded in the Sea of Japan, the country has yet to develop standard guidelines and protocols to prepare this information. Very few test-case ESI maps were available for Japan, and the data that was collected emphasized commercial and industrial use rather than conservation of natural

resources. Thus, it was necessary for CNFJ to develop ESI maps for its own use. Lessons learned from CNFJ's efforts could be a valuable input into the development of Japan's ESI guidelines.

The final mapping effort will be used for oil spill trajectory impact analysis and planning purposes. In order to effectively prepare future maps, it is recommended that the following steps be taken throughout the mapping effort:

- Extensive research before site visits
- Cooperation with local experts for knowledge of the area
- Allow for extra time at each site for data collection as unforeseen obstacles and weather may arise
- Continual communication between developers and end users.

Following these recommendations will increase the likelihood of preparing accurate survey data in the proper format to be used effectively in oil spill planning and modeling efforts.